

[illegible]

## Claims

- [c1] 1. A method for controlling reductant injection in an exhaust system of an engine having an upstream oxidation catalyst and a downstream lean NOx catalyst, the method comprising:
- determining an amount of NOx exiting the upstream oxidation catalyst;
  - calculating a ratio of NO to NO2 contained in said amount of exiting NOx;
  - calculating an amount of reductant to be injected based on said second amount of NOx and said ratio; and
  - adjusting a signal for controlling injected reductant based on said calculated amount of reductant to be injected.
- [c2] 2. The method recited in Claim 1, wherein said determining said amount of exiting NOx comprises reading a NOx sensor value coupled in the exhaust gas upstream of said lean NOx catalyst and downstream of said oxidation catalyst.
- [c3] 3. The method recited in Claim 1, wherein said calculating said ratio is based on engine operating conditions.
- [c4] 4. The method recited in Claim 1, wherein said calculating said ratio is based on engine operating conditions, said engine operating condition being an engine feed gas NOx amount.
- [c5] 5. The method recited in Claim 4, wherein said feed gas NOx amount is calculated based on engine speed and load.
- [c6] 6. A system for an exhaust gas system of a diesel internal combustion engine, the system comprising:
- an upstream oxidation catalyst for converting a portion of incoming NO into NO2;
  - a downstream lean NOx SCR catalyst for converting at least some of said NO and NO2 exiting said upstream oxidation catalyst into nitrogen in the presence of a reductant;
  - a reductant injection system coupled upstream of said lean NOx catalyst and downstream of said upstream oxidation catalyst;
  - a sensor coupled upstream of said lean NOx catalyst; and

a controller for determining an amount of NO<sub>x</sub> exiting the upstream oxidation catalyst, calculating a ratio of NO to NO<sub>2</sub> contained in said amount of exiting NO<sub>x</sub>, and adjusting an amount of reductant to be injected by said reductant system based on said second amount of NO<sub>x</sub> and said ratio.

- [c7] 7. The system recited in claim 6, wherein said controller further determines degradation of the upstream oxidation catalyst based on said ratio of NO to NO<sub>2</sub>.
- [c8] 8. The system recited in Claim 6, wherein said sensor is a NO<sub>x</sub> sensor.
- [c9] 9. The system recited in Claim 6, wherein said reductant includes urea.
- [c10] 10. The system recited in Claim 6, wherein said reductant system includes a control valve that receives a signal from said controller.
- [c11] 11. A method for treating exhausts gasses of an internal combustion engine, comprising:  
combusting fuel containing sulfur;  
maintaining a ratio of NO to NO<sub>2</sub> in the exhaust gasses within 50% of a 1:1 ratio under predetermined operating conditions;  
passing said maintained exhaust gasses, and a reductant, to a lean NO<sub>x</sub> catalyst in an engine exhaust; and  
diagnosing degradation of the treatment of exhaust gasses based on a sensor that measures the exhaust gasses.
- [c12] 12. The method recited in Claim 11, wherein said maintaining further comprises providing an upstream catalyst.
- [c13] 13. The method recited in Claim 11, wherein said maintaining further comprises adjusting an exhaust gas recirculation amount of the engine.
- [c14] 14. The method recited in Claim 11, wherein said reductant is urea.
- [c15] 15. The method recited in Claim 11, wherein said predetermined operating conditions include engine speed, engine load, and temperature.
- [c16] 16. A system for reducing exhaust gas NO<sub>x</sub> of a diesel internal combustion



of within 50% of a 1:1 molar ratio; and  
a downstream lean NO<sub>x</sub> SCR catalyst for converting said a second portion  
of NO and NO<sub>2</sub> exiting said upstream oxidation catalyst in the presence  
of a reductant; and  
a controller for determining an amount of reductant to be injected  
between said upstream and downstream catalyst based on an estimate of  
an actual NO to NO<sub>2</sub> ratio.